

U.S.S.N. 10/050,322

Remarks

Thorough examination by the Examiner is noted and appreciated.

Applicants have amended the claims to overcome Examiners objections and rejections under 35 USC 112, second paragraph, and in response to the withdrawal of Ohuchi. Support for the amended claims is found in the original and previously presented claims. No new matter has been added.

Finality of Rejection

Applicants respectfully request Examiner to withdraw the FINALITY OF REJECTION as Examiner has applied newly cited art not of record **not necessitated** by Applicants amendments. Rather, Examiner has withdrawn previously applied art in response to Applicants amendments and arguments. See e.g., MPEP 706.07

A second or any subsequent action on the merits in any application or patent involved in reexamination proceedings **should not be made final if it includes a rejection, on prior art not of record, of any claim amended to include limitations which should reasonably have been expected to be claimed.** See MPEP § 904 *et seq.* For example, one would reasonably expect that a rejection under 35 U.S.C. 112 for the reason of incompleteness would be replied to by an amendment supplying the omitted element. Furthermore, a second or any subsequent action on the merits in any application or patent undergoing reexamination proceedings **will not be made final if it includes a rejection, on newly cited art, other than information submitted in an information disclosure statement filed under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17 (p), of any claim not amended by applicant or patent owner in spite of the fact that other claims may have been amended to require newly cited art.**

U.S.S.N. 10/050,322

Claim Rejections under 35 USC 112

Claims 11, 25, and 12 have been amended to overcome Examiners objections and rejection under 35 USC 112, second paragraph.

Claim Rejections under 35 USC 103

Claims 1, 3, 5, 7, 11-13, 23-26, 30-38 stand rejected under 35 USC 102(e) as being obvious over Tsai (US 6,787, 455) in view of Douglas (US 5,545,290).

Statement of Common Ownership Pursuant to 35 USC 103(c)

Applicants' attorney of record state that Tsai et al. (US 6,323,121 B1) and Applicants instant application were, at the time the invention was made, owned by Taiwan Semiconductor Manufacturing Company. Therefore, Examiners use of Tsai et al. as a reference in a 103(a) rejection appears to be improper under 35 USC §103(C).

However, while not agreeing Tsai et al. may be properly be used as a reference in a rejection under 103(a), assuming *arguendo* that it is a properly used reference, Applicants respectfully traverse Examiner's rejection under 35 U.S.C. 103(a).

U.S.S.N. 10/050,322

Tsai et al. disclose a method for forming an opening using a **bi-layer photoresist** wherein a **dry development process** of an underlying resist layer is carried out using a plasma comprising **oxygen, carbon monoxide, and argon** (see abstract). Nowhere does Tsai disclose using **nitrogen, oxygen and argon** in the dry development process as Applicants disclose and claim.

On the other hand, Douglas discloses a method for **trench etching** providing a high level of control over the sidewall profile of the trench and a high degree of selectivity to the etch mask. The method of Douglas is disclosed for etching silicon and tungsten. In a silicon etching method, carbon monoxide or nitrogen is added as a passivant to silicon etchant gases such as HBr, HBr/SF₆, BCl₃, and SiCl₄. The etch mask is disclosed to be **silicon dioxide or photoresist**. Douglas discloses that the principal of operation of the passivant gases includes "passivating the surface of the silicon substrate and preventing reaction between the silicon substrate and the **halogen atoms** generated from the HBr-based discharge" as well as passivating **resist or silicon dioxide during** the silicon or tungsten etching process to improve resistance (selectivity) of the etching mask (**resist or silicon dioxide**) to etching. Douglas discloses that the passivant gases create weak bonds to the sides of the mask and the trench during dry etching of the trench with **halogen**

U.S.S.N. 10/050,322

gases to improve selectivity (resistance to dry etching) of the mask. Moreover, Douglas discloses forming a **resist etching mask** is formed according to **conventional photolithographic processes** which implies a wet development process.

Nowhere does Douglas disclose a bi-layer dry development process, or a silicon containing resist layer overlying a non-silicon containing resist layer, or any other aspect of Applicants disclosed and claimed invention.

There is no apparent motivation for combining the silicon or tungsten etching process of Douglas with the bi-layer resist development process of Tsai et al. The bi-layer development process of Tsai et al. works by a different principal of operation than the trench etching process of Douglas. For example, Tsai et al. teaches first **forming an etching mask in an upper silicon containing resist layer prior to dry developing** the underlying resist using carbon monoxide and oxygen to form a **bi-layer etching mask** for etching an opening. Tsai et al. additionally teaches that the upper resist layer **may be removed** by an **ashing process** prior to etching an opening (col 5, lines 55-62). Thus the combination of the teachings of Douglas of passivating a single resist layer etching mask **during etching of an opening** with the teachings of Tsai et al. of bi-layer resist

U.S.S.N. 10/050,322

developing followed by removal of an upper resist layer by an ashing process prior to etching an opening would destroy the principal of operation of either the method of Douglas or Tsai et al., for example destroying the etching mask of Douglas, or destroying the dry development process of Tsai et al.

Even assuming arguendo, a proper motivation for combining the teachings of Tsai et al. and Douglas, which Applicants do not concede, such combination does not produce Applicants disclosed and claimed invention.

"A prior art reference must be considered in its entirety, i.e., as a whole including portions that would lead away from the claimed invention." *W.L. Gore & Associates, Inc., Garlock, Inc.*, 721 F.2d, 1540, 220 USPQ 303 (Fed Cir. 1983), cert denied, 469 U.S. 851 (1984).

"If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious." *In re Ratti*, 270 F.2d 810, 123, USPQ 349 (CCPA 1959).

"The mere fact that references can be combined or modified does not render the resultant combination obvious unless the

U.S.S.N. 10/050,322

prior art also suggests the desirability of the combination." *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

Nowhere does Douglas recognize or suggest a solution to the problem that Applicants have recognized and solved by their claimed invention:

"A method for etching an opening using a bi-layer photoresist to improve an etching resolution and reduce particulate contamination".

Therefore Tsai et al., singly or in combination with Douglas fails to make out a *prima facie* case of obviousness with respect to Applicants disclosed and claimed invention.

The Claims have been amended to clarify Applicants claimed invention in response to Examiners withdrawal of Ohuchi et al. in recognition by Examiner that Ohuchi fails to teach an ashing step following a plasma etching step. A favorable consideration of Applicants' claims is respectfully requested.

Based on the foregoing, Applicants respectfully submit that the Claims are now in condition for allowance. Such favorable action by the Examiner at an early date is respectfully solicited.

U.S.S.N. 10/050,322

In the event that the present invention as claimed is not in a condition for allowance for any other reasons, the Examiner is respectfully invited to call the Applicants' representative at his Bloomfield Hills, Michigan office at (248) 540-4040 such that necessary action may be taken to place the application in a condition for allowance.

Respectfully submitted,

Tung & Associates

Randy W. Tung

Reg. No. 31,311

Telephone: (248) 540-4040